Image Interpolation
图像内插

DingHao

CVBIOUC
http://vision.ouc.edu.cn/~zhenghaiyong

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Contents

Brief Introduction

Image interpolation is a method of constructing new data points within the range of a discrete set of known data points.

Functions:

- Scaling
- Rotate
- Geometric Correction

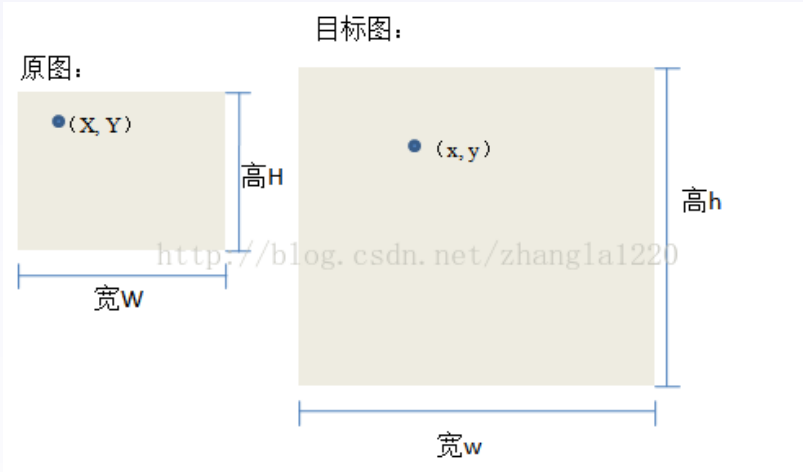
Relarge Images

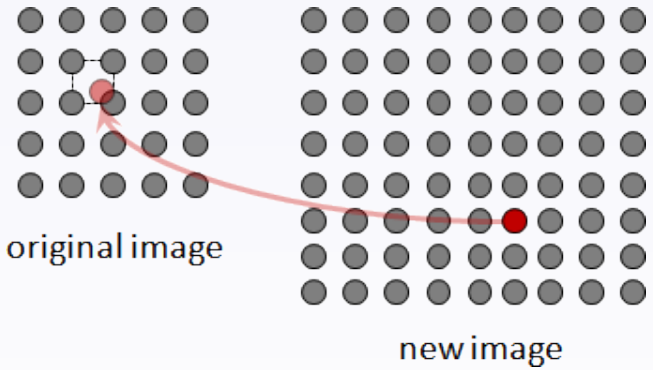
The purpose of enlarging image (upsamplin / interpolating) is to enlarge the original image so that it can be displayed on a higher -resolution display device.

Classification

- Traditional algorithm
  - Nearest neighbor interpolation
  - Bilinear interpolation
  - Bicubic interpolation
- Interpolation based on edge
  - Low-resolution
  - High-resolution
- Interpolation based on area
- Other methods

Nearest neighbor interpolation





Code

Codes for nearest neighbor interpolation

Result

Bilinear interpolation

1.$f(x,y) \approx$
$f(0,0)(1-x)(1-y)+f(1,0)x(1-y)+f(0,1)(1-x)y+f(1,1)xy$

2. $v(x,y) = ax + by + cxy + d$

Coefficients:

- a=f(1,0)-f(0,0)
- b=f(0,1)-f(0,0)
- c=f(1,1)-f(0,1)-f(1,0)+f(0,0)
- d=f(0,0)

Code

Codes for bilinear interpolation

Result

Bicubic interpolation

$$f(x,y) = \sum_{i=0}^{3} \sum_{j=0}^{3} a_{ij} x^i y^j$$

The value of the coefficients a_{ij} depends on the characteristic of the interpolation data.

As for each dot of each unit, we have to drag the coordinates (0,0) , (1,0) , (0,1) and (1,1) into the 16 equations to get the results.

Code

Codes for bicubic interpolation

Result

Comparison

Conclusion

1. Completeness:

Bicubic interpolation > Bilinear interpolation > Nearest neighbor interpolation

2. Difficulty:

Bicubic interpolation > Bilinear interpolation > Nearest neighbor interpolation

→ Bilinear interpolation satisfies the needs of most relarged images without complex arthmetic.